

Nutritional Factors in Dental Caries

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The relationships of nutrition to tooth decay can be divided into two major categories: those effects occurring during tooth development which alter the susceptibility to decay of these teeth after they erupt, and those effects which alter the incidence and extent of dental caries in teeth which are already fully formed.

An example of the relationship of nutrition during tooth development is shown in the rodent experiments of Sognnaes.¹ If weanling rats and hamsters born to females fed laboratory chow throughout the reproductive cycle were fed the chow diet for periods of as long as 9 months after weaning, practically no carious lesions developed in the molar teeth. When weanling white rats and hamsters born to mothers maintained on chow throughout pregnancy and lactation were fed the purified ration for 4 to 8 months, a few carious lesions developed in their molar teeth. In contrast, when female rats and hamsters were changed from chow to the purified ration at parturition and their offspring maintained on the latter diet for 3 to 5 months after weaning, the molar teeth of the offspring developed a rather high number of carious lesions. A still higher rate of dental caries experience was observed in the offspring of female rats and hamsters which had been fed the purified ration throughout pregnancy and lactation. Experiments with rhesus monkeys have provided similar results.² The molar teeth which were developed while the monkeys were existing in their native environment proved to be a great deal more resistant to caries than the molar teeth which were formed in the same monkeys during periods of maintenance on purified diets.

Strong suggestions of similar trends in human populations are available from statistics which have been methodically collected in the school clinics of Europe. Sognnaes³ has assembled and analyzed available reports on the trends in dental caries experience

among European children during the past forty years. A total of 27 surveys were evaluated which included observations on three-fourths of a million children from eleven European countries; Czechoslovakia, Denmark, England, Finland, France, Germany, Holland, Norway, Scotland, Spain and Sweden. Most surveys contained data which had been collected by trained examiners at yearly intervals over a period of several years and which had been tabulated by narrow age groups for limited geographical districts. Sognnaes concluded that the teeth of European children showed a definite and relatively uniform tendency to a decreased incidence of tooth decay toward the latter part of and following both World War I and II. The reductions in tooth decay were most significant in young children and in those teeth of older children which developed and/or matured during the war years. After the initiation of wartime dietary regimens, there seemed to be several years' delay before an appreciable reduction in the susceptibility of individuals to tooth decay was observed. Following the first World War there was an even greater delay in the return to the prewar susceptibility to tooth decay. Insufficient time has elapsed since the recent war to determine how long the present low dental caries attack rate will continue. The marked reductions in dental caries experience among European children during the latter years of World Wars I and II cannot be explained entirely on the basis of an oral environmental effect produced by a reduction in the refined carbohydrate content. The sudden onset of restrictions in the refined carbohydrates available for distribution and the constant amounts available for rationing throughout the years 1940 to 1944, inclusive, eliminate any argument that the reduction in dental caries incidence was gradual and prolonged because of a gradually increasing restriction in refined carbohydrates. If the oral environment, as in-

fluenced by the composition of the diet, had been the preeminently important factor in determining the dental caries experience of these children, the reduction in tooth decay should have been evident within a year or two in all children with recently erupted teeth regardless of whether the teeth were formed before, at or after the initiation of the wartime dietary regimen. In view of the long delay in the production of a reduction in dental caries experience, it appears likely that the wartime diets appeared to have permitted the formation and maturation of teeth which were less susceptible to the development of carious lesions.

Numerous relationships of diet to the maintenance of fully formed teeth have been described. Methods have been studied for altering the initiation and rate of development of carious lesions in fully developed molar teeth of weanling cotton rats and common laboratory rats which had been bred for high caries-susceptibility. When representatives of the susceptible strains of both species were maintained for appropriate periods after weaning on high carbohydrate, purified rations a high caries attack rate was observed. If diets were fed in which the level of fat, or protein, or both were increased at the isocaloric expense of carbohydrates, appreciable reductions in dental caries experience were observed. If the sole source of nutrients was mineralized whole milk, no carious lesions developed in either species of highly susceptible rodents; as much as 10 per cent of sucrose or other soluble carbohydrates by weight could be dissolved in the mineralized whole milk without any appreciable increase in the dental caries experience. At least part of

the reduced development of carious lesions observed when milk diets were fed has been shown to be due to its fluid nature. Thus, there are numerous dietary procedures in rodents by which development of dental caries after tooth formation is largely completed can be influenced.

Reductions in the dental caries attack rate were observed by Boyd and co-workers⁴ in diabetic and in normal children fed adequate diets over long periods. These reductions were attributed by the investigators to the nutritional adequacy of the diet. Certain experiments⁵ pointed strongly to the maintenance of a favorable calcium and phosphorus retention. Careful dietary counselling of outpatients has been reported by Howe, White and Elliott⁶ and by Becks and Jensen⁷ to give reductions in the occurrence of new lesions by a magnitude of 60 to 70 per cent.

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